BSc (Hons) in Information Technology

IT2080 – Information Technology Project Year2, Semester2, 2023

E – Channeling Management System

Project Proposal Document

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Introduction

OUR Client/ Company Environment

"Care24" is a company that connects clients with experts in the medical or wellness industries and offers health care to clients on the island. The customer or business is in the central province, near the Dambulla area. For our client, this is a brand-new system that will soon meet all its functional, non-functional, and technological requirements for the establishment of a fresh branch.

This corporation wished to improve its features and services by using the most recent technology, as well as the market itself, more effectively than their competitors. It is a digital system that offers convenience and flexibility to patients who can access healthcare services from the comfort of their homes. The system typically involves a web-based portal that patients or users can use to book appointments with doctors/tastings, view available slots, order medicines to their doorstep as well as manage their medical records.

The system also offers features such as online billing and invoicing, the generation of electronic prescriptions, and report generation to make it easier for providers to manage their practice.

ABOUT THE PROJECT

This project's primary goal would be to handle users, patients, doctors and surgeons, staff members, appointments, and payments accurately/ continuously. This system makes it simple for them to manage all their daily tasks without causing them any discomfort.

With so many user-friendly, real-time interfaces and inventive parts, this system also helps newly built sub-systems and novel components.
Our aim in this project is to improve their day-to-day paperwork by moving their current techniques and procedures to a newly developed, technologically advanced online application that can be used at any time after going through authentication procedures.

Hence, compared to humanoid processes, this system is more essential, secure, and effective.

Problem Statement

- Customer should reach manually.

  We learned throughout the feasibility study that customers must physically visit the lab to schedule appointments and do lab tests. Due to health regulations, it is extremely difficult to visit a store like this during a pandemic situation.

- weak document keeping and storage facilities.

  We came across the warehouse management system, which is something that most businesses do not bother to look at. The buyer and provider experience considerable inconsistencies due to improper database administration and storage handling. This is embarrassing for the whole sector. This crucial element is constantly ignored by many firms, which has the unfavorable effects of low production and poor customer satisfaction.

- Need to move modern technology.

  Not only our corporate workforce, but also our labor workforce, must keep up with the times and adopt modern technology as Sri Lanka moves closer to becoming a technologically viable nation. Sri Lanka needs to avoid going deeper and deeper down a rabbit hole despite its low level of technological literacy.

- Maintaining Manual Records

  Since a few years ago, we have seen that this business has many manual records of its clients and patients. As a result, it was difficult for them to handle the medical histories, eyeglasses verification, and vision reports of their prior clients.

- Physical Payments

  Health authorities and the government have been forced to make it abundantly clear that any form of business or business type should be managed in line with strict health laws because of the current global pandemic. Paper checks are no longer accepted, even in the absence of a pandemic, so we need to find an alternative that is more favorable

Solutions

- Online self - service tool for clients and patients

  In this pandemic situation, it is quite difficult to physically access a store with health recommendations; therefore, in our system, we offer an online web-based system for setting appointments and channelings and assisting users in manually managing their channelings.

- Web based Database for Backups and Realtime Updates

  Since everything in this system is cloud-based and subject to simultaneous backup processes, real-time updating, and record keeping, staff members do not need to worry about maintaining records or backups.

- A User-Friendly Program with Instructions

  Since company environments are continually altering, both the public and commercial organizations must adjust to the brand-new circumstances. Automation frees up time that may be spent on attempts to address user requests and concerns. This application may be maintained indefinitely by anyone who has a basic understanding of computer operations.

- Cloud computing and global warehouses

  Simply put, a place in the system where things are held or stored is referred to as a warehouse. Due to its adaptability, warehousing has developed into a vastly more sophisticated and complex industry over time. This is being combated by placing more focus on the warehouse's role in attaining product goals including faster cycle times, lower costs, lower inventory, and better customer service. It is now undergoing redesign to better serve the goals of suppliers and buyers.

- Use mobile payment methods.

  All payments for enterprise-related transactions should be completed online to save money because the health authorities are working hard to contain the pandemic. Given the circumstances, our main objective is to experience as few physical touches as possible. During the epidemic, no company could take risks with its employees.

Benefits

- Real time data updating
  - Update inventory details on time without any delay. This means that as soon as new data is generated, it is immediately integrated into the existing dataset, and any associated analyses or visualizations are updated accordingly.

- Low cost
  - This system minimizes human resources and thus its cost will be minimized. The system gives accurate information and reduces wastage and unnecessary wastage.

- Generate reports automatically.
  - Automatically generate reports and update details weekly. Therefore, there is no need for manual documentation. After submitting a sample this system gives accurate reports automatically.

- Manage stocks online.
  - The inventory officer can reorder, dispatch, and check the availability. If the stocks are running out notification will be generated through the inventory officer's portal and clicking on that notification the officer can reorder stocks

- Payments are automated.
  - Users can pay bills and pay for checkups by using the payment portal. Payments can be made by cash or card.

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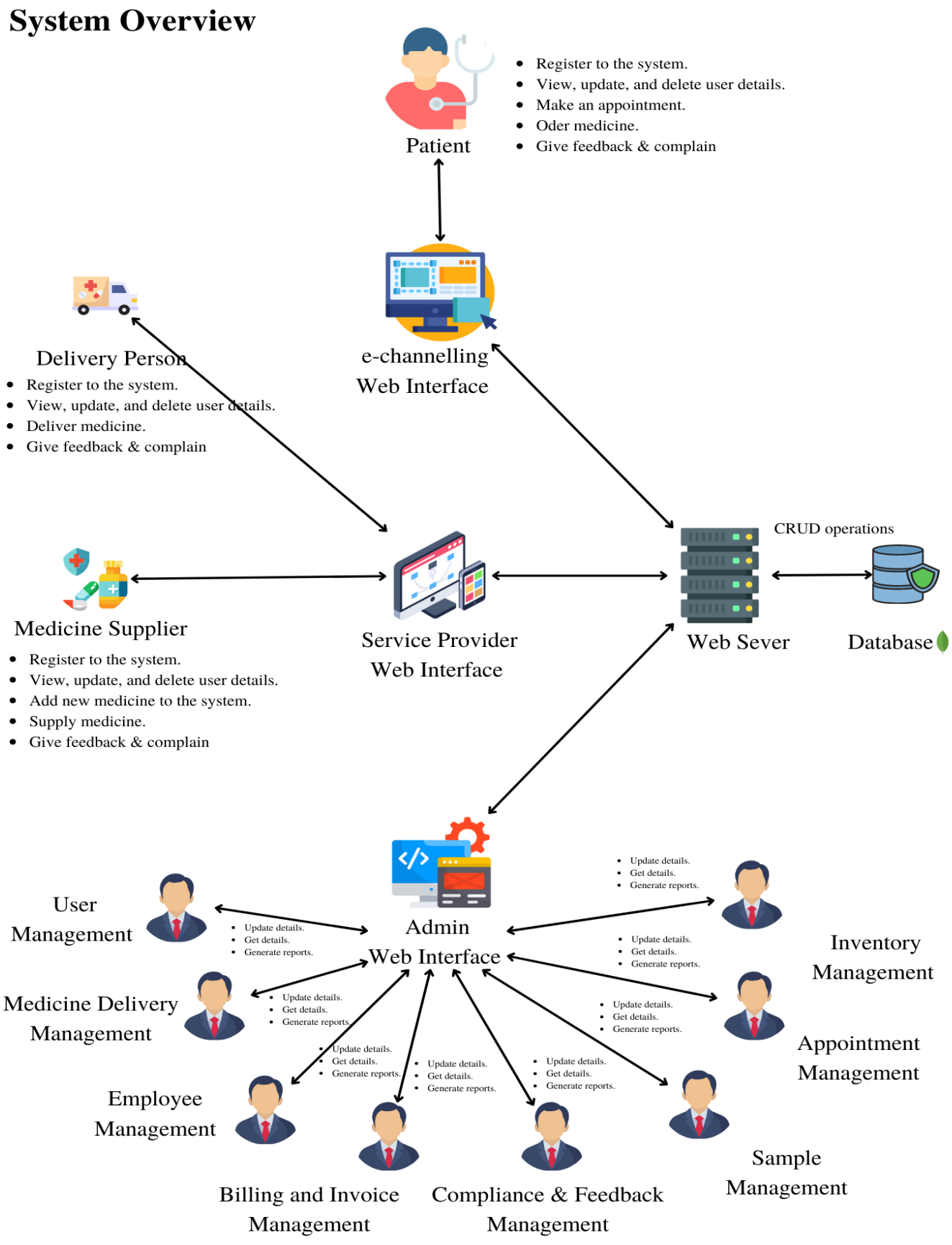
System Overview



1. User Management

In this e-channeling management system, the user management function is an essential component that enables the efficient management of users who access the system. This function grant administrators to create, update, and delete user accounts. In addition, assign different roles and permissions to each user.
With this function, administrators can confirm that only authorized users have access to the system, maintaining data security and restricting unauthorized access. Additionally, this function contributes to the audit trail of user activities, allowing an administrator to track and analyze user activities.
Also, allow customization of user profiles, allowing an administrator to collect and store valuable information about each user, such as contact details and appointment history. Those data are used to provide customized services and improve user experience.

Additional features

This user management function offers a range of additional future that upgrade future control and flexibility in managing user accounts.

- User authentication
  Provide secure authentication options, such as password protection and two-factor authentication, to that only authorized users have access to the system.
- User grouping
  Group users based on their roles and permissions, allowing easier management of many users.
- User activity monitoring
  Monitor user activities (login time and session durations, ensuring compliance with company policies)
- User privilege management
  Assign different levels of access and permissions to individual users, providing granular control over system access.
- User self-service
  Allow users to update their own profiles, reset passwords, and manage their own permissions, reducing the workload for administrators.
- User reporting
  Provides detailed reports on user activity, including login attempts and system usage, helping administrator to identify potential security risk or areas for improvement.

Novelties

- Cloud-based user management
  Allow administrators to manage user accounts from anywhere, at any time, and on any device. This enables greater flexibility and mobility in managing user accounts, increasing the efficiency of the system.
- Multi-factor authentication
  Provides an additional layer of security by requiring users to provide multiple authentications. This can include something the user knows, such as a password, and something the user has, such as a mobile device or security token.
- User analytics
  Allow administrators to gain insights into user behaviors, preferences, and usage patterns. This information can be used to improve the user experience, personalize services, and identify potential areas for improvement.

Functional Requirements

- User registration
  Users can create their account by providing the necessary information, such as name, email address, and password.
- User login
  Users can log in to their account using their login credentials.
- User profile management
  Users can update their profile information, such as their contact details and preferences.
- User account management
  Administrators can create, update, and delete user accounts, assign roles and permissions, and manage user groups.
- User activity monitoring
  Administrators can monitor user activities (login times and session durations) and track user actions within the system.
- Password reset.
  Users can reset their password if they forget it or need to change it for security reasons.
- User authentication
  The system should have secure authentication options, such as password protection and two-factor authentication, to ensure that only authorized users have access to the system.

Non-functional Requirements

- Security
  The system must be secure to prevent unauthorized access and protect user data from potential threats.
- Performance
  The system must be fast and responsive, with low latency and high availability.
- Usability
  The system must be user-friendly and intuitive, with clear navigation and a consistent user interface.
- Scalability
  The system must be able to handle many users and user requests without compromising performance.
- Reliability
  The system must be reliable, with minimal downtime and high availability.

Technical Requirements

- MERN Stack
  The user management function will be built using the MERN stack, which includes React.js for the frontend, MongoDB for the database, Express.js for the backend, and Node.js for the server.
- RESTful API
  The system will use RESTful API to enable communication between the frontend and backend, allowing for seamless data exchange.
- Authentication and Authorization
  The system will use industry-standard authentication and authorization methods, such as JSON Web Tokens (JWTs) and OAuth2, to ensure secure access to the system.
- Database Design
  The database will be designed to support the user management function, with appropriate tables and indexes to optimize performance.
- Testing
  The system will be thoroughly tested to ensure that it meets all functional, non-functional, and technical requirements, with unit testing, integration testing, and system testing.

2. Employee Management

This module helps the administrator to keep track of employee information in a centralized location, which is easily accessible to authorized personnel. This employee management module allows the administrator to maintain an up-to-date database of employee records, including their personal information, work history and analytics. The system's user-friendly interface makes it easy for the administrator to add, update, and retrieve employee information as needed.

The system captures attendance data of employees. It automates the process of tracking employee attendance and leave applications. When employees are going to apply for leave, check their attendance records through the system, while the administrator can approve or reject leave applications. The system also generates reports that provide managers with insights into employee attendance. that helps to manager take some decisions.

The employee management module also includes a salary management feature that enables the organization to manage the salary of each employee. The system automates the process of calculating the salary of the employee. The system also generates salary reports.

The administrator ensures to manage employees' information in the system by keeping accurate records of employee data, tracking attendance, and generating reports.

Staff members can access their information on employee profiles. which provides a convenient and secure way to view their information. Through their profiles they can view their information, past attendance records, working hours, salary, and their submitted leave requests status.

Its features, such as salary management, attendance tracking, and employee profiles, provide organizations with an efficient way to manage their employees'. These features, ensure that the staff is well-managed and that employees are well supported, leading to increased productivity and job satisfaction and overall organizational effectiveness.

Non-Functional Requirements

- **Availability –** this refers to the system's ability to accessible to staff and administrator at any time, without disruptions.
- **Reliability –** The system's ability to perform consistently and accurately over time, without unexpected failures or errors.
- **Security –** The system's ability to prevent unauthorized access, protect sensitive data, and ensure the confidentiality, integrity. This ensures security of employee information.

3. Appointment Management

- Scheduling appointments for channeling(doctor/surgent) and laboratory tests separately.

This function allows patients to book appointments online or over the receptionist, which is more convenient and accessible than traditional methods of booking appointments. Patient/ user have options to select the appointment category types such as doctor channeling and for other laboratory/machine-based tastings. It helps schedule appointments for users or patients, considering several factors such as availability of the staff or service providers, the duration of the appointment, and the type of service required. It enables the patient management part also to be connected.

- Appointment schedule handling.

Always we go through our schedule before submitting any appointment. It must be established a link with the doctor/ lab in charge and the patient/user.

- Always, appointment's part must be updated.

Once a patient/user schedules an appointment, it can update or delete it for any necessary reason by notifying the receptionist. After users/patients attend their appointments, the receptionist will update the site for each case.

- Generate Reports regarding appointments.

For the convenience of documentation part, receptionist can generate reports regarding to all the appointments pending, which finished and the schedule situation.

Overall, the appointment management function is an essential component of any service-based industry, helping businesses or healthcare providers manage appointments efficiently, reduce waiting times, and improve customer or patient satisfaction.

4. Sample Management (Test Result Management)

The sample management function in this system involves the Lab Analyst managing the samples submitted to the laboratory for testing. This includes receiving, logging, tracking, and managing the samples throughout the testing process.
When a sample is received, the Lab Analyst Creates a new sample record in the system, which includes details such as the sample type, date of receipt, patient information, and test requested.

This function allows Lab Analyst to easily access and modify sample records, allowing to him to Update, and Delete samples with ease. The sample management function also includes a powerful search engine (Retrieve) that allows users to locate the sample records quickly and easily they need.
Lab analyst reports the test results back to the healthcare provider who submitted the sample, providing updates on the status of the sample and any issues that arose during testing. The system helps by providing reporting and analytics capabilities, allowing users to easily generate reports and share information with healthcare providers as needed.

Once testing is complete, the lab analyst reviews and validates the test results, ensuring that they are accurate and meet specified quality standards.
Additionally, the sample management function offers a secure data storage system, ensuring that all sample records are kept safe and secure.
Finally, the system allows users to set up automated notifications, so that they can be informed of any changes or updates to their samples.

5. Inventory Management

Inventory Management function is an essential part of our E-channeling management system. This function refers to the process of controlling the flow and medical supplies, and other required medical equipment. The goal of inventory management is to ensure there is a sufficient supply of necessary items to meet the laboratory's needs while minimizing costs and waste.

The inventory officer can create orders, view stocks, generate reports, dispatch stocks, transfer stocks etc. To access the inventory window the officer should sign in correctly by using an accurate username and password.

Once the stock comes to the reorder level, a notification will be sent to the inventory officer’s profile as “Stock are running out, please place an order.” By clicking on that notification officer can reorder stocks.

The officer should check the availability of stock by every weekend and generate reports then send those to all the departments and ask for confirmation.

Once the new stocks arrive, the officer should dispatch stocks through every department. If stocks are enough, then new dispatch orders cannot be generated through the officer’s profile.

We always use FIFO (First in First Out) method to ensure that inventory items are used before newer items. This method helps to prevent wastage and expiration of products.

6. Medicine Delivery Management

The Medicine Delivery Management function enables users to order prescription medication online and have them delivered to their home or preferred location. It provides a convenient and accessible way for patients to receive the medication they need, without having to visit a pharmacy in person.

Users can upload a prescription or just type the medications they need, in the medicine ordering section. Then the users or patients can initiate the process of placing a medicine order by providing other necessary details such as delivery address. After that, they must wait for the pharmacist's approval. If approved, the required amount should be paid to continue the order. Meanwhile, users can track their medicine delivery request status from the dashboard. It is also possible for them to cancel a medicine delivery request before the delivery process starts.

As the pharmacist, he/she can receive medication orders through the web application, so they can verify prescription or custom medicine request details. The pharmacist manages the pharmacy's inventory, adding latest items as needed and updating the quantities and prices of existing items. The pharmacist reviews the orders and confirms their validity before approving them, and if they are approved, then prepares the medications for delivery. They approve medicine delivery requests after verifying the prescription details and the availability of the medicines.

Pharmacists can also add the costs and update the pharmaceutical inventory stocks. Calculation of the bill for a patient's medicine order, including the cost of medicine, delivery fees, and any applicable taxes is also done by the pharmacist. And updating the process statuses enables patients to track the status of their orders. Based on availability and workload, assigning delivery persons to approved medicine orders is also the pharmacist's responsibility.

As the delivery persons, they can view all pending delivery requests which include medication orders and delivery details in detail in the system from their specific profile dashboard. Hence, they can plan their route and ensure timely delivery. The delivery persons can accept their assigned jobs and update the status of the delivery for each order. The system then updates the order status accordingly.

Non-Functional Requirements

- **Scalability –** This Medicine Delivery Management function can be expanded by integrating with a pharmaceutical management system and a delivery partner to ensure that medication orders are processed correctly, inventory levels are maintained, and the package is delivered successfully.
- **Availability –** Patients should be able to place a medicine delivery request anytime and view the status of a currently placed order.
- **Performance –** System performance is important because the system should be able to handle many user requests and multiple users' activities simultaneously.

7. Compliance and & Feedback Management

Compliance and feedback management are important aspects of any system, including e-channeling systems. Here are some key points to consider:

- Compliance:

Ensure that your e-channeling system complies with all relevant laws, regulations, and standards in your area.

Implement appropriate security measures to protect users' personal and health information, such as encryption and access controls.

Regularly review and update your system's policies and procedures to ensure ongoing compliance.

- Feedback Management:

Provide users with a convenient way to provide feedback, such as through a feedback form or survey.

Actively monitor and respond to feedback to address any issues or concerns that users may have.

Use feedback to inform system improvements and updates, such as adding new features or improving user experience.

It is also important to communicate with your users about compliance and feedback management, including how their personal information is protected and how their feedback is used to improve the system. This can help build trust and confidence in your e-channeling system.

8. Billing and Invoice Management

Billing and invoice management involves the processes and systems used by businesses to generate, send, and manage invoices for products or services provided to customers. Except for payment processing this system allows its users to generate bills and invoices, send them to certain customers and track their paths, do follow-ups to remind the customer of the outstanding payment, record keeping and reporting.

The billing and invoice management module automates the payment process by introducing an online payment portal where customers can pay according to the service they received. First admin is needed to check and verify the payment and then the system generates an invoice that includes details such as the product or service provided, the quantity, the price, and any applicable taxes or discounts. The system can also store records of the bills and invoices it issued and allows authorized personals to refer them.

This module allows accountants to investigate the billing and invoice records to keep track of the money flow of the company. Accountants can use data from the system to manage the company accounts. They are also allowed to update and view the accounts they keep, which is needed in creating reports such as financial reports.

The financial manager authorized the service catalog, which includes changing prices, changing available services, and introducing and removing discounts. The financial manager can approve payroll and benefits for employees, including processing payments and calculating taxes. The financial manager is also allowed in the viewing.

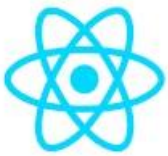
Effective billing and invoice management helps businesses ensure timely payment and reduce the risk of revenue leakage. It also helps businesses maintain accurate financial records and avoid disputes with customers over payments.

9. Tools and Technologies

- "**Visual Studio Code**" is the platform/IDE we use to develop the coding.

- "**MongoDB**" is the database program used for this web application.

- We are willing to use "**Express**" Server to this project.



- For the front-end – "**React JS**."

- "**Node JS**" encodes the back - end.

- "**GitHub**" for source code management with group.

Literature Review

A literature review on e-channeling management systems reveals a significant amount of research on this topic in recent years. E-channeling management systems are used to facilitate the booking and scheduling of appointments with medical professionals while laboratory systems are used for a variety of purposes, including research and medical testing.

One study published in the International Journal of Medical Informatics in 2019 explored the use of laboratory information systems in medical testing. The study found that these systems can improve efficiency in the laboratory, reduce errors, and improve communication between laboratory staff and medical professionals. [5]

A study published in the Journal of Medical Internet Research in 2019 examined the use of e-channeling management systems to improve access to care for patients in low-resource settings. The study found that e-channeling systems can reduce wait times for appointments, improve patient satisfaction, and increase access to specialty care. [6]

Another study published in the Journal of Medical Systems in 2020 examined the use of e-channeling management systems to improve efficiency in healthcare organizations. The study found that these systems can reduce administrative workload, improve appointment scheduling accuracy, and increase staff productivity. [7]

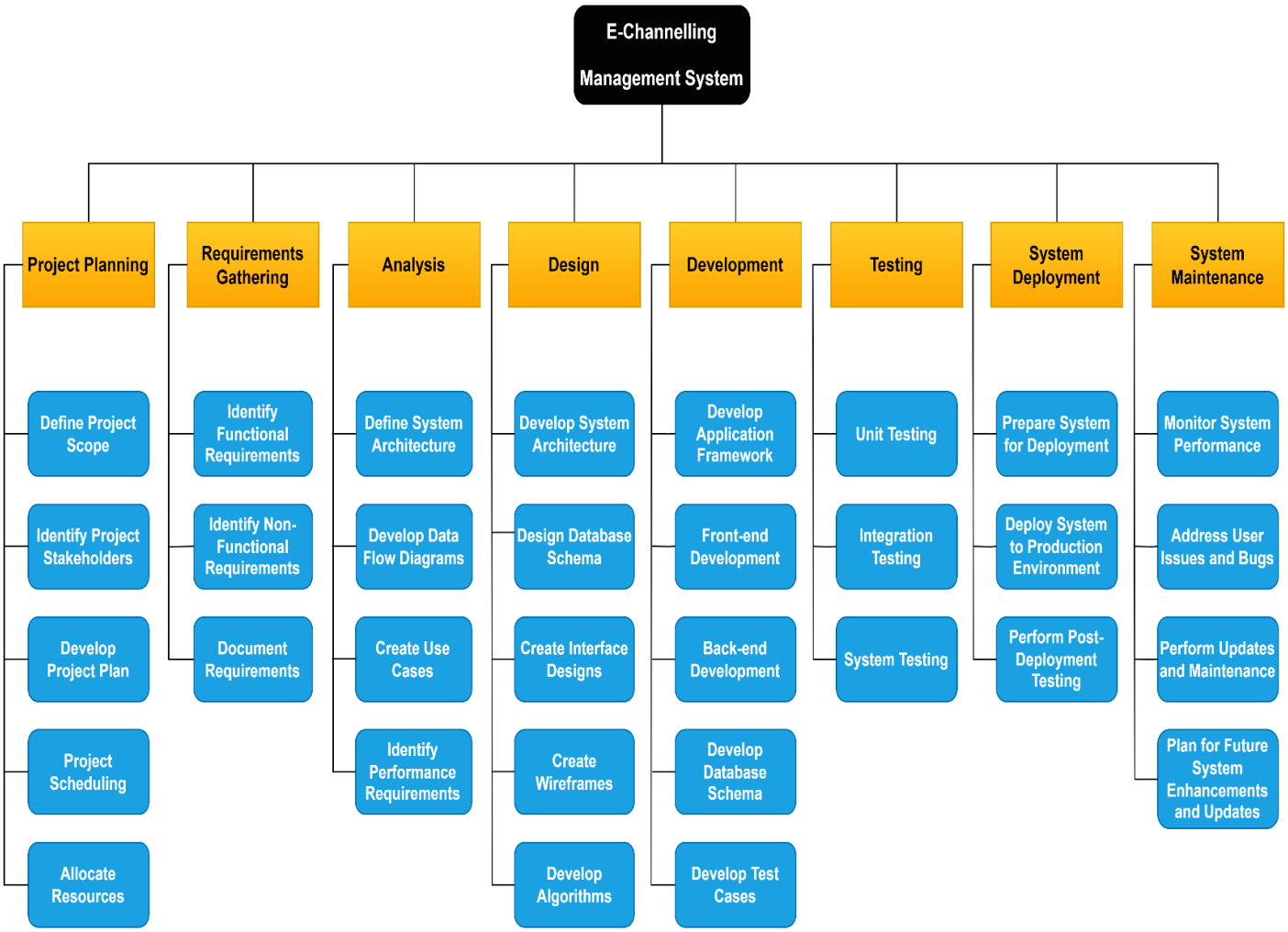
In addition to improving efficiency and access to care, e-channeling management systems have also been shown to positively impact healthcare outcomes. A study published in the Journal of the American Medical Association in 2019 examined the use of e-channeling systems to schedule appointments for patients with chronic conditions. The study found that e-channeling systems led to improved medication adherence, reduced hospitalizations, and improved patient outcomes. [8]

However, there are also challenges associated with the implementation of e-channeling management systems in healthcare. A study published in the Journal of Medical Systems in 2019 explored the challenges associated with implementing e-channeling systems, including concerns about data privacy and security, the need for ongoing maintenance and support, and the potential for patient dissatisfaction with the system. [9]

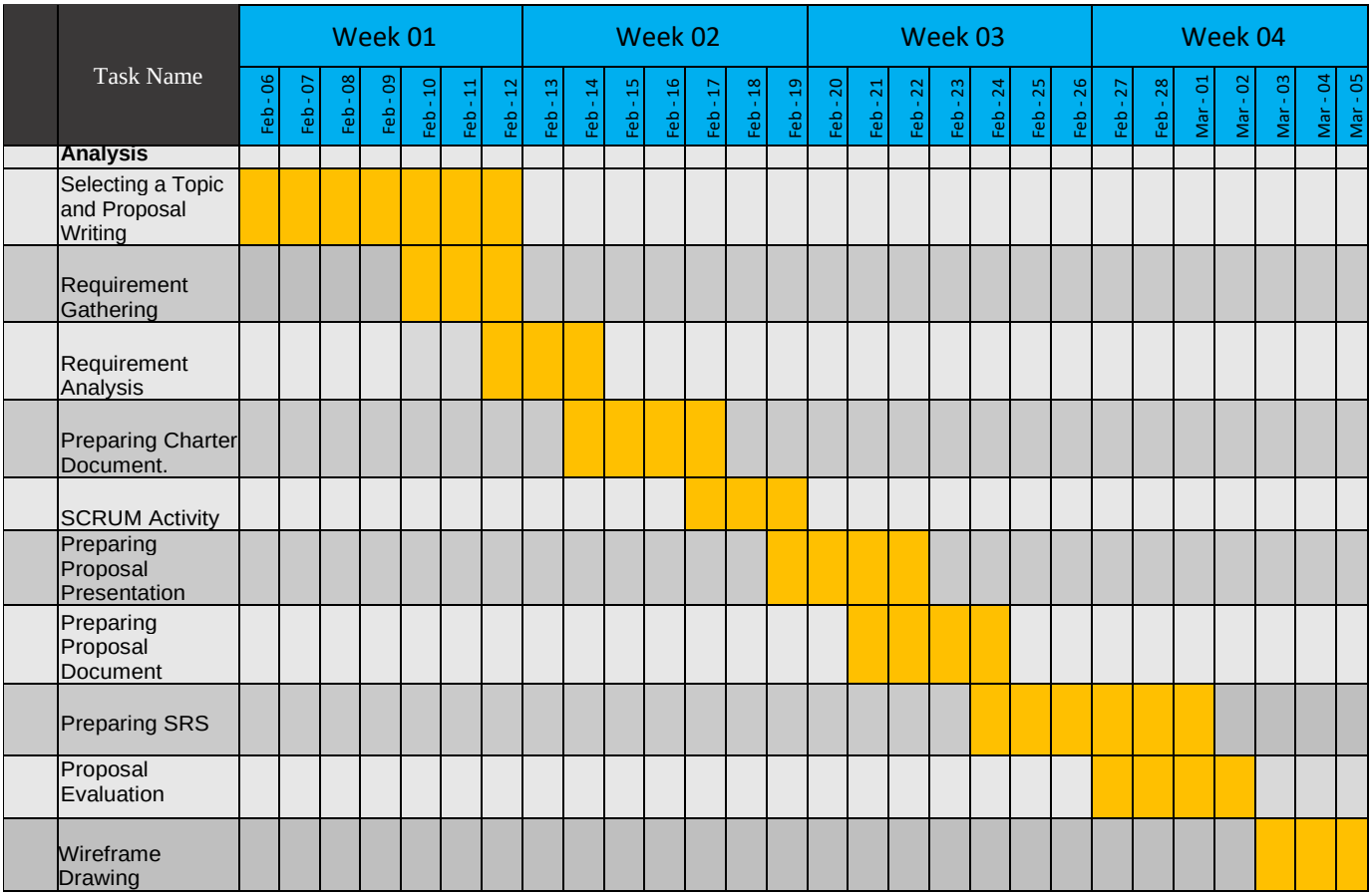
Overall, the literature suggests this type of e-channeling management systems and Laboratory management systems can improve efficiency, access to care, and healthcare outcomes. However, careful consideration must be given to the implementation and maintenance of these systems to ensure that they are effective and safe for patients. Additionally, healthcare organizations must ensure that patient privacy and data security are protected when implementing these systems.

However, other systems work on both Laboratory and e-channeling separately. This system is developed to be capable of working on both ends simultaneously. Moreover, our system can track and manage the work of non-medical staff. And the system is well equipped with the newest technologies to protect the client's privacy and security.

Work Distribution



Gannt Chart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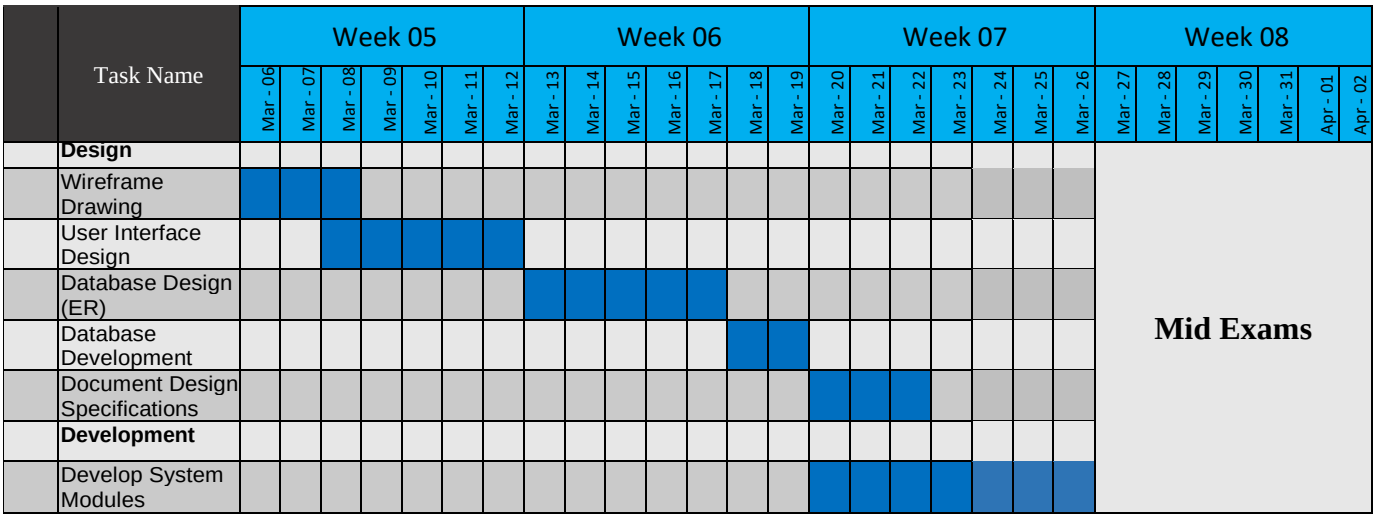
Analysis
Selecting a Topic and Proposal Writing
Requirement Gathering
Requirement Analysis
Preparing Charter Document.
SCRUM Activity
Preparing Proposal Presentation
Preparing Proposal Document
Preparing SRS
Proposal Evaluation
Wireframe Drawing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Apr - 01
Apr - 02
Design
Wireframe Drawing
User Interface Design
Database Design (ER)
Database Development
Document Design Specifications
Development
Develop System Modules
Mid Exams

Task Name	Week 09							Week 10							Week 11							Week 12						
	Apr - 03	Apr - 04	Apr - 05	Apr - 06	Apr - 07	Apr - 08	Apr - 09	Apr - 10	Apr - 11	Apr - 12	Apr - 13	Apr - 14	Apr - 15	Apr - 16	Apr - 17	Apr - 18	Apr - 19	Apr - 20	Apr - 21	Apr - 22	Apr - 23	Apr - 24	Apr - 25	Apr - 26	Apr - 27	Apr - 28	Apr - 29	Apr - 30
Development																											
Develop System Modules																											
Integrate System Modules																											
Perform Initial Testing																											
Progress Evaluation																											
Debugging																											
Final Report Writing																											
Perform System Testing																											

Task Name	Week 13							Week 14						
	May - 01	May - 02	May - 03	May - 04	May - 05	May - 06	May - 07	May - 08	May - 09	May - 10	May - 11	May - 12	May - 13	May - 14
Implementation														
Final Presentation and Viva														
Final Report Submission														
System Implementation														

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